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SCIENCE AND THE AMERICAN PRESS[1]

By DAVID DIETZ

SCIENCE EDITOR OF THE SCRIPPS-HOWARD NEWSPAPERS

THERE was a time when a speaker at a session of the American Association for the Advancement of Science spoke only to those within the sound of his voice. To-day, he may speak to the entire nation.

Even as he stands upon the platform, his words may be going over the telegraph wires to newspapers in every part of the country. In the case of the address of the president or one of the vice-presidents or in the case of an address containing some discovery of outstanding importance, the telegraphed account may run to several thousand words.

Each day of the meeting, the larger metropolitan newspapers of the nation devote from one to five columns to reports of the papers presented. The total amount of space devoted by the newspapers of the nation to the meeting is in excess of a thousand columns per day.

This is a fact of major significance in American life. It represents a change of the first order in the character and meaning of these annual meetings. It possesses profound importance for the progress of science, the conduct of journalism and the future of the nation.

The fine and friendly relations which now exist between the scientists and the press is symbolized by the fact that you have invited me to be the speaker of this general session to-day. As the former president of the National Association of Science Writers, I think that I may say that the growth of this accord has been the source of great pride and satisfaction to all its members.

There was a day when the newspapers had no interest in the reporting of science. Those were the days

[1] Address given at the general session of the American Association for the Advancement of Science, Atlantic City, December 29, 1936.

when a scientific convention was regarded as an assignment for the staff humorist. There were two accepted and traditional methods of reporting such a convention. One was to comment upon the length and luxuriousness of the beards worn by the assembled savants, the other was to make a collection of those titles of papers which contained the longest words and the ones least familiar to the ordinary reader.

The scientists, on their part, viewed the newspapers only with hostility and disdain. They asked nothing better than to be left alone to carry on their deliberations in quietness and privacy.

A change began to manifest itself after the world war, when a new public interest in science sprang up. I think that a number of causes contributed to this. One was the war itself. The war emphasized the importance of science because it was fought with weapons forged by science, new big guns, new high explosives, poison gases, airplanes and submarines.

Following the war came the wide-spread popular interest in radio. Every one was interested in this marvelous invention which brought voices and music out of the air. They wanted to know how it worked.

A third contributing factor was the post-war interest in the Einstein theory of relativity. The confirmation of Professor Einstein's prediction that the star images would be found displaced upon photographs of a solar eclipse was spectacular and dramatic. Every one wanted to know about the Einstein theory and the more that they were told they could not understand it, the more determined they were to hear about it.

To the best of my knowledge, the first newspaperman to sense this new interest in science and to see the importance of furnishing accurate and dependable scientific information to the public in a day when the world was becoming increasingly dependent upon the discoveries of science, was that far-seeing genius of journalism, the late E. W. Scripps. Mr. Scripps, after a number of conferences with the leading scientists of the nation, organized Science Service and installed the late Dr. E. E. Slosson as its first director. About the same time, I was given my first opportunity to write scientific news by George B. Parker, then editor of *The Cleveland Press*. Subsequently, when Mr. Parker became editor-in-chief of the Scripps-Howard Newspapers, I was made science editor of that chain. There were others who entered the field about the same time—Watson Davis, now director of Science Service, who became one of Dr. Slosson's first assistants, and Alva Johnston, then of the *New York Times*, who won the Pulitzer prize in journalism for his reporting of the Boston meeting of the American Association for the Advancement of Science in 1922.

That meeting in Boston was the first one to be reported in a serious and thorough fashion with a genuine effort to interpret its importance to the public. Present at it were Dr. Slosson and Mr. Davis, representing Science Service; Mr. Johnston, representing the *New York Times*, and myself, representing the Scripps-Howard Newspapers.

While I am speaking of 1922 and the years that followed soon after, I would like to express a word of appreciation for the scientists who were among the first to help and encourage us in the work that we were trying to do. Foremost among them was Dr. D. T. MacDougal, then general secretary of the A. A. A. S. Dr. MacDougal was at all times sympathetic and helpful and we remember with gratitude the cooperation which he gave us.

Others who were very helpful in those early days included Dr. Burton Livingston, then permanent secretary of the American Association for the Advancement of Science; Dr. F. R. Moulton and Dr. W. D. Harkins, of the University of Chicago; the late Dr. Michael Pupin, of Columbia University; Dr. E. B. Wilson and Dr. Harlow Shapley, of Harvard University; Dr. J. McKeen Cattell, the editor of SCIENCE; President John C. Merriam, of the Carnegie Institution of Washington; Mr. Austin H. Clark and others. The appointment subsequently of Mr. Clark as press director of the association marked an important step forward in the relations between the press and the scientists of the nation, and all of us are indebted to Mr. Clark for his excellent service.

I wish also to say a word about the treatment accorded us in those early days of scientific reporting by the American Philosophical Society. We were always made to feel welcome at their meetings. Many courtesies were shown us by the officers and staff of the society, and I am sure that we shall always look back to those days with the most pleasant of memories. I would like also to say a word about the help accorded me in those early days by two fellow Clevelanders, both members of the National Academy of Sciences—Ambrose Swasey, the telescope builder who recently celebrated his ninetieth birthday in good health, and Dr. Dayton C. Miller, past president of the American Physical Society.

With the continued growth of public interest in science, a number of important newspaper organizations began to turn their attention to the subject of science. The Associated Press and the Hearst Newspapers engaged science editors, while such newspapers as the *New York Times*, the *New York Herald-Tribune*, *Washington Star*, *Detroit News* and others assigned men to devote their major efforts to the field of science. In time there developed a group of scienc

writers who attended all the major scientific meetings of the year.

In April, 1934, when the business of organizing seemed to be becoming the great American pastime, we decided that we too ought to organize, and so the National Association of Science Writers came into existence.

Charter members of the association were Howard Blakeslee, science editor of the Associated Press; Ferry B. Colton, at that time assistant science editor of the Associated Press; Watson Davis, director of Science Service; Victor Henderson, of the *Philadelphia Inquirer;* Thomas R. Henry, of the *Washington Star;* Waldemar Kaempffert, science editor of the *New York Times;* Gobind Bahari Lal, science editor of the Hearst Newspapers; William L. Laurence, science news editor of the *New York Times;* John J. O'Neill, science editor of the *New York Herald-Tribune;* Robert D. Potter, of Science Service, and myself.

My colleagues honored me with the distinction of being chosen the first president of the association. The office of president is held at the present time by Mr. Blakeslee.

At subsequent meetings, the membership was extended to include Herbert B. Nichols, physical science editor of *The Christian Science Monitor;* Jane Stafford and Marjorie Van De Water, of Science Service, and Steve McDonough, of the Associated Press.[2] Honorary membership has been conferred upon two distinguished scientists who have rendered conspicuous service in furthering the relationship of science and the press, namely, Austin H. Clark and Dr. J. McKeen Cattell.

The National Association of Science Writers has only one purpose. This is set forth clearly in its constitution as follows: "To foster the dissemination of accurate scientific knowledge by the press of the nation in cooperation with scientific organizations and individual scientists."

I do not believe that any scientist may feel that he has completed his work when he has finished a piece of research in the laboratory. It is likewise his duty to disseminate the new knowledge which he has uncovered. And to-day, publication in a journal read by a circle of his colleagues is not sufficient. The welfare of society demands that the general public be made aware of scientific progress. This can be done only through the newspapers, and hence the scientist to-day must be willing to cooperate with the newspaperman.

How such cooperation works out to the mutual interest of the scientist and the public was demonstrated at the Pittsburgh meeting of the association in December, 1934. Present as the invited guest of the association was Professor Albert Einstein of relativity fame. His presence was equally interesting to scientists, newspapermen and newspaper readers.

Now Professor Einstein might have declined to see newspapermen, or the scientists in charge of his appearance in Pittsburgh might have refused to cooperate with us. In that event there probably would have been many attempts to obtain some sort of statement nevertheless with much unpleasantness for every one concerned.

Instead, Mr. Clark, assisted by officials of the American Mathematical Society, undertook to arrange an interview. The time was set early enough in the morning to make it possible to get the interview written and on the telegraph wires in time for publication in afternoon newspapers.

A list of questions prepared by a committee of the National Association of Science Writers was submitted to Professor Einstein in advance of the interview. It was understood by mutual agreement of both members of our association and the local reporters that Professor Einstein was to be asked questions only in the realm of science. As a result, the interview was conducted with dignity and dispatch. Professor Einstein, who on previous occasions had expressed a distaste for being interviewed, said that he enjoyed the event.

What Professor Einstein said at the interview was reported accurately and with dignity and published widely throughout the nation. My own interview was sent by the United Press not only to its clients throughout the United States but cabled as well to South America and Europe. And I am sure that the accounts written by Mr. Blakeslee for the Associated Press, by Mr. Lal for the Hearst Newspapers and by other members of our association received the widest distribution.

I would like also to mention the press arrangements at the Harvard Tercentenary Celebration this past September. I am sure that every member of the National Association of Science Writers joins me in this tribute to the wisdom and efficiency of the officers of Harvard University and all those members of the faculty who cooperated during the three weeks of the celebration and in the weeks of preparation beforehand. I regret that time does not permit me to mention by name all those who were of such great assistance to the press.

As you know, Harvard University invited some seventy-five of the most famous European scholars

[2] Since the presentation of this address, the membership has been further extended to include Philip Kinsley, of the *Chicago Tribune;* Hillyer Kriegbaum, of the United Press; L. E. Levick, of the *New York Evening Journal,* and Steven M. Spencer, of the *Philadelphia Evening Bulletin.*

as well as many distinguished American scholars to take part in the tercentenary celebration. The Harvard News Office, which is under the direction of Mr. Arthur Wild, had mimeographed copies of every address upon the program available for the press.

Collecting these manuscripts in advance was in itself considerable of a task. In addition, where the original manuscripts were in French or other foreign languages, members of the Harvard faculty made translations.

Two additional services were provided by the Harvard committee which were of the utmost importance to the newspapermen reporting the tercentenary. First, the committee arranged press conferences with such of the distinguished guests as a majority of the newspapermen desired to meet. These conferences, held under pleasant circumstances, well in advance of the particular individual's appearance upon the program, made possible a clarification of complex or involved points in the manuscripts and supplied the newspapermen with direct answers to questions which were in their mind.

Next, the committee appointed members of the Harvard faculty to act as liaison officers between the press and the various symposia and programs. This enabled newspapermen to check their impressions of the importance of various sessions, the bearing of one paper upon another, and other important points, with competent and responsible authorities.

The upshot of the matter was that the newspapermen were able to report the conference with accuracy, with dignity and with completeness. I do not believe that there was a city in the United States whose newspapers did not carry columns of reports of the Harvard meetings. As a result, the opinions of the savants gathered at Harvard were carried into the thinking of the whole nation.

In this connection, I would like to quote one sentence from a letter which I received this month from Mr. Jerome D. Greene, who was chairman of the executive committee of the Harvard Tercentenary Celebration. Mr. Greene wrote: "There seems to be general agreement that the press set a new standard by the fullness and readable quality of its reports on the formidable range of subjects covered by the Conference."

Mr. Greene's opinion is a great source of satisfaction to the members of the National Association of Science Writers and to the other newspapermen who reported the Harvard Tercentenary Conference. It repays them for the many hours of hard work and conscientious effort which went into the weeks of the conference.

This brings me to a subject which, I think, it is preeminently fitting to discuss here. Each year, the Press Bureau of the American Association for the Advancement of Science requests that you send in copies of your manuscripts or abstracts of them as early as possible. Some of you may not realize how important this is. If you will think for a moment in terms of the mechanics of newspaper reporting, you will understand the situation.

Each day, there are some twenty or thirty sectional meetings in session. The important papers on any day may be read in various sections meeting in widely separated buildings. Even if all the papers in which a particular newspaperman was interested were read in one meeting, the time element would still have to be taken into consideration. A reporter can not sit through a long session, return to his typewriter and still get his account into the day's newspapers. He must have the papers in advance.

Moreover, for the sake of accuracy, it is to the scientist's own advantage to provide the Press Bureau with copies of his manuscript. The reporter is just as eager to be accurate as the scientist is to have him accurate. The members of the National Association of Science Writers are writing daily articles under their own signatures. They have every reason for desiring to maintain their own reputations for reliability and accuracy.

Perhaps you may wonder why the newspapermen desire both complete manuscripts and abstracts. The answer to that question is again one of the mechanics of the situation. No reporter has sufficient time to read all the thousand or more papers in the Press Bureau. But with the aid of the abstracts, he can get a grasp of the essentials of each paper and then turn to the completed manuscript in those cases where he wishes greater amplification or wishes to quote the scientist at some length.

A word should also be said about the preparation of abstracts. Unfortunately, there is a certain type of abstract which is of no value at all. This is the sort of abstract which does not tell what is in the paper but merely tells what the paper is about. Let me give an illustration which is wholly fictitious, but which never the less is typical of what I have in mind.

Let us imagine that our fictitious paper has been written by an astronomer. His abstract reads as follows: "This paper will recount some researches carried on during the past year with a new kind of telescope. The telescope will be described. Some new results obtained in observations of the spiral nebulae will be described and their bearing upon theories of the evolution of the universe will be discussed."

Now it will be obvious at once that this abstract tells us nothing about what is really in the paper

We have no notion of what the telescope is like, how it was used, what was discovered with it or what conclusions were drawn from it.

The best advice that I can give you is that you play that you are a newspaperman when you write the abstract of your paper. Make it a condensed statement of your paper with all the important facts in it.

By now, you may wish to say something like this to me: You have spent a lot of time lecturing the scientists upon what they should do for the newspapers. What in return may we expect from you?

Let me say that there are many things which you have a right to expect, and I think that those of you who know the science writers best will agree that we are doing our utmost to live up to these expectations.

The scientist has every right to expect that he will be treated with fairness and respect. He has every right to expect that his paper will be reported with accuracy and with dignity, with no distortion of emphasis and with no unfair implications. He has the right to expect that the report will be such that both his own colleagues and the general public will get a fair and adequate picture of his work from it.

These are things which I know he will get at all times from members of the National Association of Science Writers. Our members are alert to their responsibilities and duties. We take the same pride in our work that the scientist does in his.

Let me turn now to the field in which the scientists of America and the newspapers of the country may cooperate, not merely for their mutual benefit but for the benefit of the entire nation. This, after all, is the most important field of all, since it justifies the existence of both the scientist and the newspaper.

The outstanding characteristics of the age in which we live are the result of the application of science to life. The span of life itself has been lengthened by the advance of medical science. The rapid and amazing developments of industry in the present century have been due to the triumphs of the scientific laboratory. First industry turned chiefly to the chemist. More recently it has turned to the physicist.[3]

In 1900 the electron was a theory. To-day, the world has put the electron to work. In the vacuum tubes of our radio sets, in the photoelectric cell, in other electronic tubes and in the x-ray tube, we are making daily use of the electron.[4]

The world is constantly changing under our very eyes. To-day, with the end of the depression, we are moving into a new world, a world of taller buildings, longer bridges, swifter trains, safer aircraft, finer homes, a world of greater beauty, deeper comfort, smoother efficiency.

Now that the depression is over, we must guard against the habit which we may have formed during the years just past, namely, the habit of thinking in terms of the depression. In planning for the future we must think in terms of America, not in terms of the depression.[5]

Nature has intended America for a great future. It has favored this nation above all others with natural resources. Equalling our mineral resources are our vast agricultural lands, timber, fisheries and water power.

But how fully we attain that future depends upon how adequately we plan our national program of scientific research.

The situation was extremely well expressed by the Science Advisory Board, of which Dr. Karl T. Compton, president of the Massachusetts Institute of Technology, was chairman, in its first report to President Roosevelt.

"In the evolution of our national life," the board reported, "we have reached the place where science, and the research which has discovered and released its powers, can not be regarded as matters of accidental growth and application, but must be consciously related to our social life and well-being."[6]

Dr. Henry A. Barton, director of the American Institute of Physics, has calculated that, prior to the depression, America spent $100,000,000 annually for scientific research.[7]

Because of drastic curtailments in expenditures for research during the depression, the total spent in the nation for this purpose has fallen off 50 per cent., Dr. Barton estimates. As he observes, those short-sighted persons who thought the world would be better off if scientific research was stopped have gotten 50 per cent. of their wish.

The first great necessity is to obtain adequate support for scientific research. This means, first of all, adequate government support.

The backbone of our national research program must be the research carried on by the government. There are many problems which affect the nation at large and which are too expensive for private enterprises to undertake.

A number of European governments have seen clearly the necessity of embarking upon large-scale programs of scientific research with the backing of

[3] A. W. Hull, "Putting Physics to Work," *Review of Scientific Instruments*, 6: 377, 1935.

[4] Karl T. Compton, "The Electron: Its Intellectual and Social Significance," SCIENCE, 85: 27–37, 1937.

[5] David Dietz, "Science, Uncle Sam, and the Future," *Review of Scientific Instruments*, 7: 1, 1936.

[6] Report of the Science Advisory Board, Washington, D. C. September 20, 1934. Page 11.

[7] H. A. Barton, "Scientific Research in Need of Funds," *Literary Digest*, 119: 18, June 29, 1935.

the government. England has a program which is superior to our own.

The dictatorships of Europe have seen the importance of scientific research and are doing everything that they can to further it. Both Italy and Germany have extensive research programs. The outstanding example in this respect is Russia.

This October, the cables from Russia told of a new five-year plan. Stalin had ordered the Soviet Academy of Sciences to embark upon a five-year plan of scientific research for the development of Russia's natural resources.

In a democracy, those things which a dictator may order upon a moment's notice must be achieved more slowly. An intensive scientific program backed by government support is possible only if the public sees the need for it and asks for it.

In conclusion, I want to say a word about the important work which scientists and journalists together can do to disseminate and make clear the spirit of science. Mistaken individuals make much of what they are pleased to call the impersonality of science. They point out that the same airplane which carries a health-restoring serum to a family isolated in the frozen north can be used to drop bombs upon the women and children of Madrid. This is true, but it is not the way the scientist would have it. This is not in accord with the spirit of the scientist who toils all his life in a medical laboratory and gives his discoveries freely to the whole world.

Upon other occasions I have discussed the spirit of science.[8] In bringing these remarks to a close, I wish to do so again. Science brings a spirit, its own guiding spirit in which there is hope for mankind.

To the scientist, the practical applications have always been secondary. He has sought primarily to understand nature and the universe. This does not mean that the scientist is contemptuous of the practical uses of science. The opposite is true. But it does mean that the true scientist is motivated by a higher aim than that of making life easier.

Secondly, the spirit of science is the spirit of courage. The scientist is not bound by ancient tradition. Copernicus dared to cast aside the Ptolemaic theory, though it had dominated man's thought for centuries. Vesalius challenged the authority of Galen's anatomy, even though it had ruled since the time of the Romans.

Third, science is the spirit of tolerance. The scientist knows that there is no monopoly upon truth. He sees the advance of science as a great cooperative venture of all nations and peoples down through the years. The rôle of every science is an international one.

And finally, the scientist is humane. He is concerned for the future of mankind. The picture of the scientist as a man who shuts himself away in his laboratory like a hermit in a cave is an unfair picture.

Let Einstein, whose theories represent man's greatest flight to-day into the world of the abstract, speaks for the scientist's interest in the concrete facts of life. Addressing the students of the California Institute of Technology upon one occasion, he said:

> It is not enough that you should understand about applied science, in order that your work may increase man's blessings. Concern for the man himself and his fate must always form the chief interest of all technical endeavors. Never forget this in the midst of your diagrams and equations.

To-day, as we look about us at a world over which hangs the terrifying possibility of another general war, we too must make our chief concern "man himself and his fate."

We must make it plain that science is no blind and unbridled force, careless of man and his future. The scientist is thinking of the welfare of mankind.

The scientist is conscious of the smallness of his knowledge. But he is also conscious of the greatness of the power which so little knowledge has given mankind. And so he faces the future with courage.

The ancient Psalmist, standing beneath the stars exclaimed:

> When I consider Thy heavens, the work of Thy fingers, the moon and the stars, which Thou hast ordained; What is man, that Thou art mindful of him? And the son of man, that Thou visitest him?

But the ancient psalmist understood the greatness of man as well as the greatness of the universe, for he added:

> Yet Thou hast made him little lower than the angels and hast crowned him with glory and honor. Thou hast made him to have dominion over the works of Thy hands; Thou hast put all things under his feet.

Science looks forward with confidence and courage to the day when man shall realize the best that is in him. In the task of realizing that day, scientists and journalists must work side by side.

[8] David Dietz, "The Story of Science," fourth ed., Dodd, Mead and Company, 1936. Pages 350–353.

SCIENTIFIC EVENTS

THE LALOR FOUNDATION

THE Lalor Foundation is organized for the advancement of scientific research and encouragement of the arts. Its activities are maintained through income from a permanent endowment fund contributed by members of the Lalor family.

The trustees are of the belief that the energy to-day directed toward research in pure science is disprop-

tionately small compared with the effort and money expended in industrial research and applied science. Further support for purely scientific research is imperative if the boundaries of our knowledge are to be broadly extended and if overall well-balanced progress is to be maintained. The trustees have felt that a series of awards could be designed to contribute to this need. Accordingly, current income received by the foundation will be expended for awards to mature scholars of demonstrated ability to afford opportunity to them to carry on advanced research and study under the freest possible conditions.

The foundation will maintain five awards per year of $2,500 each to be paid over a twelve months' period. Appointment is open to both men and women residents of the United States and no age limit is prescribed, but the usual range of ages will be between 25 years and 40 years. High intellectual and personal qualifications as well as creative ability and capacity for productive scholarship are essential elements in the appraisal of candidates.

The fields of work in which awards will be granted are determined by the board of trustees. Prospectively for the next several years awards will be for work in various fields of chemistry and intimately related sciences. In general, the awards may be used for work anywhere. However, in recognition and memory of the late Dr. Arthur Amos Noyes, founder of the Research Laboratory of Physical Chemistry at the Massachusetts Institute of Technology, one of the awards for each of the next four years will be specifically assigned to work at that institution.

Recipients of awards are to present complete reports at the conclusion of their terms of appointment as well as informal interim reports on request. The Lalor Foundation, at its option, may contribute to the publication of important research of high merit accomplished by holders of its awards. The qualifications and attainments of the candidates as well as their proposed program of work will be passed upon by the advisory board and recommendations made to the trustees. Final selection and announcement of awards for 1937–38 will be made in February, 1937.

Officers of the foundation are:

President ..... Charles L. Reese
Vice-president ..... Anna Lalor Burdick
Treasurer ..... Elwyn Evans
Secretary ..... C. Lalor Burdick
Assistant Secretary ..... Doris M. Jarmon

Members of the advisory board are:

Dr. Roger Adams, head of the department of chemistry, University of Illinois.
Dr. Katharine Blunt, president, Connecticut College for Women.
Dr. Harrison E. Howe, editor, *Industrial and Engineering Chemistry.*
Dr. Henry G. Knight, chief, Bureau of Chemistry and Soils, U. S. Department of Agriculture.
Dr. Charles A. Kraus, head of the department of chemistry, Brown University.
Dr. Arthur B. Lamb, professor of chemistry, Harvard University.

GIFT BY THE JULIUS ROSENWALD FUND TO THE COMMITTEE ON RESEARCH IN MEDICAL ECONOMICS

DR. EDWIN R. EMBREE, president of the Julius Rosenwald Fund, announces that the fund has made a grant of $165,000 over a five-year period to the Committee on Research in Medical Economics. This committee has recently been incorporated in New York, with Michael M. Davis as chairman, the other members being Robert E. Chaddock, professor of statistics, Columbia University; Henry S. Dennison, president, Dennison Manufacturing Company, Framingham, Mass.; Walton H. Hamilton, professor of law, Yale University, and director of the Bureau of Research, Social Security Board, Washington; Alvin S. Johnson, director of the New School for Social Research, New York; Paul U. Kellogg, editor of *The Survey Graphic,* New York; Harry A. Millis, professor of economics of the University of Chicago; Fred M. Stein, retired banker, New York.

The committee will have an advisory board, to be enlarged as required, the following physicians now being members: Drs. Samuel Bradbury, Philadelphia; Alfred E. Cohn, New York; Alice Hamilton, Washington; Ludwig Hektoen, Chicago, and Franklin C. McLean, Chicago.

This committee will conduct and assist studies in the economic and social aspects of medical care; will train personnel for this field, and, in cooperation with the medical profession and other agencies, will furnish information and consultation services in behalf of rendering medical care more widely available to the people at costs within their means. The committee will have headquarters in New York City.

Since 1928, Mr. Embree stated, "the Julius Rosenwald Fund has been actively at work with the aim of reducing the costs of medical services and of making them more accessible to people of small incomes. Now the organized medical profession, hospitals and many industrial and governmental agencies are engaged in practical experiments in different parts of the country, organizing medical care to reduce costs or developing methods of getting these costs into the family budget.

"Hence there is now less need for the promotion of action than for the guidance of action through scien-

tific and dispassionate studies. The fund therefore welcomes the opportunity to make a grant of this kind to a committee of social scientists and business men, with a distinguished medical advisory board. With this grant, together with the grant of $100,000 recently made to the American Hospital Association to promote voluntary hospital insurance, the trustees have terminated their department of medical services, believing that these two agencies will now carry forward vigorously the fund's long-standing and successful work in this field."

Michael M. Davis, who is chairman and the active director of the new committee, has been, since 1928, the director of the department of medical services. He has been associated for many years with work in medical economics and with hospitals and clinics in New York, Boston and Chicago, is the author of a number of books and many articles, chairman of the council of the American Hospital Association and active in numerous national public health and welfare agencies.

DU PONT FELLOWSHIPS FOR RESEARCH IN ORGANIC CHEMISTRY

THE E. I. DU PONT DE NEMOURS AND COMPANY has decided to increase the number of fellowships it awards annually to six post-doctorate fellowships and eighteen postgraduate fellowships for the academic year 1937–38. This action has been taken because of the success of the plan in encouraging and developing organic chemical research. These fellowships, which will be held at eighteen leading universities and colleges, are maintained to encourage more promising students in research work in the field of chemistry. Last year, the company awarded four post-doctorate fellowships and twelve postgraduate fellowships.

Since these awards were first offered in the academic year 1918–19, there have been granted 350 fellowships and 34 scholarships in 33 universities, and, in addition, a national fellowship was awarded at the Johns Hopkins University for a period of four years.

The purpose of the plan is primarily to promote the advancement of science and the scientific training of young men and to cooperate with the educational institutions in their efforts to carry on advanced research work. The du Pont fellowships differ from the usual industrial fellowships in that they are not restricted to research on subjects directly connected with the du Pont products. Experience has proved that the broad purpose of the plan is best served by permitting the colleges to select the beneficiary of the fellowships and the research subject as well.

An appropriation of $26,500 has been made for the year 1937–38 to be allocated as follows: $13,000 for six post-doctorate fellowships at $2,000 each, with $1,000 to cover the cost of equipment needed in the work of this group, and $13,500 for eighteen postgraduate fellowships at $750 each. The eighteen institutions selected are the University of Chicago, Columbia University, Cornell University, Harvard University, University of Illinois, the Johns Hopkins University, the Massachusetts Institute of Technology, the University of Michigan, the University of Minnesota, the University of North Carolina, the Ohio State University, Pennsylvania State College, the University of Pennsylvania, Princeton University, Stanford University, the University of Virginia, the University of Wisconsin and Yale University.

The continuation and expansion of this combination (post-doctorate and postgraduate plan) will tend to further assist the universities through the post-doctorate plan in raising the quality of organic research by enabling the promising professor selected to engage in more difficult problems through employment of trained assistants. Through the postgraduate plan it will assist promising young men to obtain further education along the lines required by the chemical industry.

The du Pont fellowship plan was inaugurated in 1918. In that year, seventeen fellowships with an average stipend of $750 were made available to sixteen universities for research in chemistry. The selection of the fellows and the thesis subjects was left entirely to the discretion of the college authorities.

MEMORIAL VOLUME TO SAMUEL C. HOOKER

A COLLECTION of papers by the late Dr. Samuel C. Hooker entitled "The Constitution and Properties of Lapachol, Lomatiol and Other Hydroxynaphthoquinone Derivatives" has been published recently as a memorial volume for private distribution to interested individuals and to libraries. The papers describe a series of chemical investigations of lapachol, a yellow substance found in the grain of certain South American woods, of lomatiol, a structurally similar pigment occurring in the seeds of certain varieties of *Lomatia*, and of related substances obtained by synthesis.

Hooker was born in England in 1864, and at the age of twenty-one he obtained his Ph.D. degree at Munich in the short period of one year. Shortly thereafter he entered the employ of the American Sugar Refining Company in Philadelphia. The lapachol work was undertaken in 1889 and actively pursued in such time as was not devoted to his technological duties, and a series of eleven principal papers was published in *The American Chemical Journal* and in the *Journal of the Chemical Society* in the years 1889 to 1896. Increasing responsibilities in the industry made it necessary to discontinue the researches in organic chemistry

for nearly twenty years, but at the age of fifty-one Hooker retired and devoted a considerable part of his time in the last twenty years of his life to a continuation of the early work in the lapachol field. Publication of the results which accumulated during this period was withheld from a desire to bring the various interrelated problems to the point of well-rounded completion. This point had been reached at the time of Hooker's death on October 12, 1935, and the investigations were reported in a series of eleven posthumous papers published in the July issue of the *Journal of the American Chemical Society* for 1936. These papers, which form a natural and logical continuation of those published forty years earlier, are reprinted with the earlier papers in the memorial brochure. The history of the investigations provides an unusual example of disinterested and sustained devotion to the quest of truth.

Included in the introductory material of the volume is an obituary sketch by Dr. C. A. Browne, supervisor of chemical research of the Bureau of Chemistry and Soils. This sketch, which is reprinted with some additional notes and details from the *Journal of the Chemical Society* (1936), includes an account of Hooker's activities in other fields, for he not only was distinguished as an organic chemist but made significant contributions as a sugar technologist, a collector of books and of works of art and as an amateur magician.

The publication of the memorial volume was authorized and financed by members of Dr. Hooker's family. The volume is edited by Professor Louis F. Fieser, Converse Memorial Laboratory, Harvard University, from whom copies desired by individuals or for libraries may be obtained on application.

PRESENTATION OF THE PHILIP A. CONNÉ GOLD MEDAL TO DR. VAN SLYKE

DR. DONALD DEXTER VAN SLYKE, chief chemist of the hospital of the Rockefeller Institute for Medical Research, received the Philip A. Conné Gold Medal for 1936 of the Chemists' Club of New York, for "systematic and painstaking work of immense importance to clinical medicine," at a dinner given at the club on January 22.

Dr. Van Slyke won the medal "in recognition of his methods of blood analysis and gasometric micro analysis, and of his work on respiratory and renal reactions, diabetes and nephritis." The presentation was made by Professor Marston Taylor Bogert, of Columbia University. Dr. A. Baird Hastings, of the Harvard University Medical School, and Dr. Glenn E. Cullen, of the Children's Hospital Research Foundation and the Department of Pediatrics of the University of Cincinnati, both of whom have collaborated with Dr. Van Slyke in researches, spoke on the scientific contributions of the medalist and personal aspects of his career. Dr. Frederick G. Zinsser, of Hastings-on-Hudson, president of the club, presided.

Dr. Van Slyke said that he accepted the award as "recognition of the chemists and young physicians, laboratory comrades of a score of years, who have really done the work mentioned by the medal committee." His medal address was entitled, "Mechanism of Neutrality Maintenance in the Body."

Dr. Van Slyke was born at Pike, N. Y., in 1883. His father, Lucius Lincoln Van Slyke, was chief chemist of the New York State Agricultural Experiment Station at Geneva, N. Y., from 1890 to 1931. After studying for a year at Hobart College, Dr. Van Slyke entered the University of Michigan, where, after working with Professor Moses Gomberg on derivatives of triphenyl methyl, he received the degree of doctor of philosophy in 1907. Since then he has been associated continuously with the Rockefeller Institute for Medical Research.

On leave of absence he was a graduate student at the University of Berlin in 1911. He was visiting professor at the University of California in 1917 and at the Peiping (China) Union Medical School in 1922. In the World War, at the request of the Surgeon General of the Army, he organized at the Rockefeller Institute a training class for chemists in the sanitary corps, and on the completion of this work in 1918 he was appointed a major in the sanitary corps, but the armistice prevented his receiving his commission.

From 1907 to 1914 he worked in the laboratory of P. A. Levene, with whom he was associated in studies of proteins and amino acids. During this period he developed the nitrous acid method for gasometric measurement of nitrogen in primary aliphatic amino groups, and with Gustav Meyer used the method to trace the path of protein digestion products through the animal body. From 1914 to the present he has been chief chemist at the hospital of the Rockefeller Institute. His studies there have been directed partly to problems of theoretical and analytical chemistry and partly to problems in clinical and related physiological fields.

The Conné Medal was founded by Mrs. Philip A. Conné, New York City, in memory of her husband. It is given annually "irrespective of color, creed, domicile, nationality or sex, to an individual responsible for a discovery in chemistry which has proved of value in the treatment of human disease." Previous recipients have been John J. Abel, H. D. Dakin, Lafayette B. Mendel and Edward Doisy.

Members of the medal jury, besides Professor Bogert, were Professor D. D. Jackson, of Columbia University, Dr. Walter W. Palmer, of the Presbyterian Hospital, New York; Dean William T. Read, of Rutgers University, and Dr. Leonard G. Rowntree, of the Philadelphia Institute for Medical Research.

SCIENTIFIC NOTES AND NEWS

THE Sylvanus Albert Reed Medal of the Institute of Aeronautical Sciences was presented to Professor Edward S. Taylor, of the Massachusetts Institute of Technology, at the annual dinner of the Aeronautical Institute on January 28 at the Columbia University Faculty Club. Professor Taylor received the award in recognition of his invention of the dynamic vibration absorber.

DR. JAMES B. CONANT, president of Harvard University, has been elected a member of the Athenaeum Club, London, under the provision which empowers the annual election by the committee of a certain number of persons of distinguished eminence in science, literature, the arts or for public service.

THE Order of B'rith Abraham has established a new lodge in honor of Dr. Einstein to be known as the Albert Einstein Lodge.

AMONG alumni awards of merit to be conferred on Founders Day on January 23 by the University of Pennsylvania are the following: Dr. George E. de Schweinitz, emeritus professor of ophthalmology and trustee of the university; Dr. Robert Tait McKenzie, research professor of physical education, and Dr. Witmer Stone, vice-president of the Philadelphia Academy of Natural Sciences, director emeritus of the museum and director of North American Birds and Historical Research.

THE *Journal* of the American Medical Association reports that the January, 1937, issue of the *Archives of Dermatology and Syphilology* is a special number dedicated to Dr. William Allen Pusey. The volume was authorized by the Board of Trustees of the American Medical Association in recognition of the founding of the publication by Dr. William Allen Pusey and of his service to it since that time. All the contributors have been associated with Dr. Pusey in various activities. Dr. Pusey retires as editor of the *Archives of Dermatology and Syphilology* with the current issue. The new editor, Dr. Howard Fox, concludes the special issue with an editorial rendering tribute to the manner in which the *Archives* has been conducted by Dr. Pusey.

HONORARY membership in the Explorers Club of New York was conferred on January 18 at a luncheon at the Soviet Embassy in Washington, D. C., on Dr. Otto Yulievich Schmidt, professor in the University of Moscow and director of the Soviet Arctic Institute, in recognition of his "leadership and outstanding achievements in Polar exploration."

THE College of Physicians of Philadelphia has elected the following officers for the year 1937: *President,* Dr. George P. Müller; *Vice-president,* Dr. Edward B. Krumbhaar; *Secretary,* Dr. J. Harold Austin; *Treasurer,* Dr. T. Grier Miller.

DR. D. P. MORGAN, chemical economist of Scudder, Stevens and Clark, investment counsel, has been made chairman for 1937 of the New York section of the American Chemical Society. He succeeds Dr. Lawrence W. Bass, who resigned recently as director of research for the Borden Company to join the staff of the Mellon Institute of Industrial Research in Pittsburgh. Dr. Duncan A. MacInnes, of the Rockefeller Institute for Medical Research, was elected *vice-chairman,* Dr. Cornelia T. Snell, *secretary,* and C. R. de Long, *treasurer.*

DR. J. B. JOHNSTON, professor of neurology and since 1914 dean of the College of Science, Literature and the Arts at the University of Minnesota, having passed the age of sixty-eight years, will retire at the close of the academic year. He will be succeeded as dean by Dr. John T. Tate, professor of physics, who will take office on July 1.

DR. R. S. HAWKINS has been appointed acting dean of the College of Agriculture and director of the Experiment Station of the University of Arizona, beginning on November 1. He takes the place of Dr. Paul S. Burgess, who was recently elected president to succeed Dr. Homer LeRoy Shantz.

DR. BYRON STOOKEY, associate professor of neurological surgery at the Columbia University School of Medicine, will succeed Dr. Charles Albert Elsberg as chief of neurosurgical service at the Neurological Institute of New York, an affiliate of the Columbia Medical School. Dr. Elsberg, who has been associated with the Neurological Institute since its founding in 1909, will retain his post as professor of neurological surgery in the medical school of the university.

DR. WILLIAM BOYD, professor of pathology in the University of Manitoba, has been appointed professor of pathology in the University of Toronto, to succeed the late Dr. Oskar Klotz.

DR. LEVERING TYSON, director of the National Advisory Council on Radio in Education under the auspices of the Carnegie Corporation, has been elected president of Muhlenberg College.

ARTHUR S. COGGESHALL, chief of the Illinois State Museum, Springfield, has been appointed director of the Santa Barbara Museum of Natural History, California.

DR. C. C. MACDUFFEE, professor of mathematics at the University of Wisconsin, has been chosen man-

aging editor of the *Transactions* of the American Mathematical Society for a period of two years.

PAUL H. ALLEN has been appointed resident manager of the Tropical Station of the Missouri Botanical Garden at Balboa, Panama. He plans to conduct a scientific survey of plant life in Panama and to make collections.

THE Lord President of the council of the British Department of Scientific and Industrial Research has appointed Dr. E. B. Bailey, professor of geology in the University of Glasgow, to be director of the Geological Survey of Great Britain and of the Museum of Practical Geology. Professor Bailey served on the staff of the Geological Survey from 1902 until December, 1929.

D. L. EDWARDS, of Sidmouth, has been appointed director of the Norman Lockyer Observatory at Salcombe Hill, England, in succession to the late Dr. W. J. S. Lockyer. Mr. Edwards joined the observatory staff when the late Sir Norman Lockyer was in charge. The new assistant is D. R. Barber, of Exeter.

PROFESSOR EARLE R. CALEY, of the department of chemistry of Princeton University, has been granted a leave of absence for the second semester in order to establish a field laboratory at the site of the Agora Excavation in Athens, Greece. As a member of the excavation staff he will continue his investigations on the composition, restoration and preservation of ancient materials and objects. This project has been made possible by a grant from the Penrose Fund of the American Philosophical Society.

DR. RICHARD T. COX, associate professor of physics at New York University, will lead an expedition to South America in order to make a study of electric eels in their natural environment. The expedition will make its headquarters at the Goeldi Museum, at Para. Dr. Carlos Estevam, director of the museum, will permit the use of several large pools on the museum premises as proving grounds. Part of the time will be passed at Marajo Island at the mouth of the Amazon.

EMMOT R. BLAKE, assistant curator of birds at the Field Museum of Natural History, sailed from New York for Georgetown, British Guiana, on January 21, to be absent about five months. He plans to collect specimens of the hoatzin, a rare bird, for a proposed habitat group in the museum. On his arrival in British Guiana, he will organize a group of native helpers. The first work will be along the coast, and on the Berbice River, where the hoatzins will be sought. When this is completed, he will proceed into the interior.

DR. SYLVANUS GRISWOLD MORLEY, of the Carnegie Institution of Washington, and Dr. Frans Blom, Maurice Ries and Daniel Leyrer, associates in the department of Middle American research of Tulane University, sailed on separate expeditions for Guatemala on January 13. Dr. Morley will supervise the restoration of a staircase bearing Maya hieroglyphics. Dr. Blom will engage in a six-week expedition through Guatemala on muleback, by airplane and automobile for the International Railroad of Guatemala, to compile data and gather photographs to be used in a book on the country.

DR. ARTHUR H. COMPTON, professor of physics at the University of Chicago, will give the main address at the convocation of the University of Missouri on February 9.

DR. HENRY NORRIS RUSSELL, research professor of astronomy and director of the observatory at Princeton University, lectured on "The Atmospheres of the Planets" in the Dohme series at the Johns Hopkins University on January 2.

DR. DEXTER S. KIMBALL, dean emeritus of the College of Engineering at Cornell University, was guest lecturer at the University of Maine on January 14 and 15. He spoke on "Engineering as a Vocation" before students in the orientation course and delivered two lectures to engineering students on "Administrative Engineering."

PROFESSOR WALTER SCHILLER, of Vienna, who is visiting the United States, gave a Mayo Foundation lecture on January 22 on "New Findings in Ovarian Tumors."

THE departments of geology and geography at Syracuse University and the Institute of Geographical Exploration at Harvard University have arranged a series of exchange lectures. On February 9, 10 and 11, Professor George B. Cressey will deliver a series of lectures at Harvard on the geography of China, and on April 29 through May 1, Professor Erwin Raisz will lecture on cartography at Syracuse.

PROFESSOR NIELS BOHR, director of the University Institute for Theoretical Physics at Copenhagen, is giving lectures in America and will proceed to Japan. On January 28 and 29 he lectures under the auspices of the departments of mathematics, philosophy and physics of New York University. The subjects of the two lectures are "The Structure of Nuclei" and "The Problem of Causality." They will be given at 4:30 in the main building of the Washington Square division. On February 8 and 9, Professor Bohr lectures at the University of Toronto. These lectures are entitled "The General Problem of Measurements in

Atomic Theory," "Transmutations of Atomic Nuclei" and "Light and Life," the last a popular lecture. Professor Bohr will also lecture on "The Problems of Elementary Particles" at the third Washington Conference on Theoretical Physics, held from February 8 to 13 under the auspices of the Carnegie Institution of Washington and the George Washington University.

ON account of the illness of Pope Pius the date for inauguration of the new Pontifical Academy of Science, originally scheduled for February 6, has been changed to May 11.

THE forty-ninth annual meeting of the American Physical Society will be held in Memphis, Tenn., from April 21 to 24. The Hotel Peabody will serve as headquarters for the society, where the meetings of the various sections will be held. Demonstrations, in charge of Dr. O. S. Gibbs, will be made at the College of Medicine of the University of Tennessee. Dr. O. W. Hyman is chairman and Dr. T. P. Nash, Jr., is secretary of the local committee.

A MEETING of the Optical Society of America will be held at Corning, N. Y., on Friday and Saturday, March 5 and 6. Additional sessions may possibly be scheduled for March 4, if warranted by the number of contributed papers. A special feature of the meeting will be the opportunity offered through the courtesy of the Corning Glass Works to see at first hand many applications of optics in the glass industry and the contributions of the glass industry to optics. Of particular interest to members of the society is the manufacture of glasses with special transmission characteristics. Among these products are colored signal glasses, glass for "daylight" lamps, heat-absorbing and ultraviolet transmitting glasses. The Corning Glass Works has cooperated also in the production and standardization of signal glasses for railroad, airplane and automobile transportation.

THE Midwestern Psychological Association will hold its twelfth annual meeting at the University of Illinois, on April 23 and 24, under the presidency of Dr. Harvey A. Carr. The title of Dr. Carr's address will be "The Search for Certainty."

THE first session of the twelfth annual meeting of the Hawaiian Academy of Science was held on the evenings of December 3 and 4 in Honolulu. President Harold A. Wadsworth, professor of soil physics at the University of Hawaii, presided. Ten papers on physics, geology, botany, plant migrations, plant quarantine, plant physiology, population, standards of living and medical science were read.

THE following resolution was adopted by the American Society of Naturalists at the recent Atlantic City meeting: The American Society of Naturalists observes with regret an increasing tendency in certain parts of the world to require of investigators the conformity of their research to officially prescribed doctrines. This society wishes to emphasize that intellectual progress is compatible only with perfect freedom in the conduct of investigation and in the announcement both of results and of conclusions based upon those results. Attention is called also to the fact that the scientific world can place no reliance upon reports of research carried on under conditions which limit its freedom by an enforced agreement with any preconceived views or dogmas.

School and Society prints a communication entitled "Racial Hygiene and the Nobel Prize," signed "Nobel Laureate." It reads: "In a recent Munich paper is a picture of Prof. Dr. med. Alfred Ploetz of Herrsching bei München, who—it is stated—has been proposed for the Nobel Prize on the ground of his researches in Racial Hygiene. It is not stated whether the candidature is in respect of Peace, Literature or Medicine. In the *Münchener Neueste Nachrichten* of November 3, 1936, is an article: 'Nervenwirkstoffe: Zur medizinischen Nobelpreisverleihung,' referring to this year's award of the Nobel Prize in Physiology and Medicine to Sir Henry Dale, of London, and Dr. Otto Loewi, of Graz. The work on 'Vagusstoff' is described, together with the demonstration by H. H. Dale that this is acetylcholine. The name, however, of Dale's colleague in the work and the prize, Otto Loewi of Graz, is altogether withheld. Presumably it would not be in the interests of 'Racial Hygiene,' or perhaps of Dr. Ploetz's candidature, to print it."

WILLIAM A. SARGENT, of Brookline, who died on December 20, bequeathed $300,000 to Amherst College. The sum of $200,000 is left in memory of his mother to be divided between the Massachusetts General Hospital and the New England Deaconess Hospital.

THE *Journal* of the American Medical Association states that Dr. William T. Corlett, professor emeritus of dermatology, Western Reserve University School of Medicine, has furnished and endowed a room in the Cleveland Medical Library dedicated to research in dermatology and syphilology. Dr. Corlett has given his library, which is said to contain many rare items in several languages, and has placed in the room the mahogany furniture used in his office before his retirement. There are also portraits and busts of famous figures in the history of dermatology. Dr. Corlett, who is now eighty-two years old, retired from the faculty of Western Reserve in 1924.

DISCUSSION

A SEX DIFFERENCE ENCOUNTERED IN THE TRANSPLANTATION OF A CARCINOMA OF THE OVARY[1]

A CARCINOMA of the ovary has been continued by subcutaneous transplantation since November 26, 1935.[2] During that time the tumor has been carried through twelve transfer generations. The first experiment consisted of implanting the tumor into one male and three females of the CBA strain—close relatives to the original mouse, which developed the neoplasm spontaneously. Two of the females and the male grew the implanted tissue progressively. In the second transfer generation eight females and four males of the same strain were inoculated with tissue from a mouse in the first experiment. Five of the females and all four of the males grew the tissue. Thus in the first two transfer generations seven out of eleven females grew the tissue, whereas all five of the males grew the implants they received from the same tumor. From the third through the twelfth transfer generations 162 additional mice of the CBA strain have been implanted. Of these 58 were females and 104 were males. One of the 58 female mice inoculated grew the tissue; all the 104 males grew the implant. The one female to grow the tissue occurred in the sixth transfer generation—the significance of which is still in doubt. Thus it appears that since the tissue has been established through two transfer generations it is now capable of growing only in the male mouse. A further genetic and endocrinological analysis of the observed sex difference will be forthcoming.

LEONELL C. STRONG
ROBERT T. HILL

A NEW SOURCE OF DIPHYLLOBOTHRIUM INFECTION

A COLLECTION of tapeworms from the intercostal muscles of *Natrix sipedon* taken near Ithaca, N. Y., on June 18, 1936, was given to the writer by Elmer E. Brown while at the University of Michigan Biological Station.

Recent examination of this material shows it to be a tangled mass of plerocercoids, eighteen in all. Seven complete specimens disengaged from the group range from 22 mm to 186 mm in length, with slit-like bothria which average 0.35 mm long and 0.113 mm wide. The broadest portion of the worms, at a distance of 0.437 mm behind the bothria, measures 1.312 mm. From this point they taper to a width of 0.612 mm at a distance of 0.35 mm from the posterior end. They have all the appearance of plerocercoids belonging to the genus Diphyllobothrium. This I believe to be the first record of a sparganum in snakes in the United States and I designate it as *Sparganum browni* n. sp.

Stiles[1] reported *Sparganum proliferum* from a man in Florida, and Moore[2] records *Sparganum mansoni* from a human case in Texas. Faust[3] found *Natrix tigrina* in the Orient harbored *S. mansoni*. Li,[4] in China, demonstrated other spargana in frogs and snakes to be the plerocercoids of *Diphyllobothrium erinacea* and *D. decipiens*. Recently, Mueller[5] has described *D. mansonoides* from cats in New York state.

Since *Natrix sipedon* is a great fish eater, a systematic examination of this snake and small fish from streams in the vicinity of Ithaca and Syracuse, N. Y., might disclose the source of the infection of water snakes with this sparganum. Live plerocercoids from such a source fed to cats may prove it to be *Diphyllobothrium mansonoides, D. mansoni* or a new species.

LYELL J. THOMAS
UNIVERSITY OF ILLINOIS

THE EFFECT OF LIGHT ON THE VITAMIN C OF MILK

THE interesting article on vitamin C in pasteurized milk by Professor Sharp[1] prompts me to describe here very briefly the results of the work on the vitamin C of milk which has been carried out at our institute during the last few years. A full account of the work[2] will appear in the last number of the current volume of the *Biochemical Journal*. I think, however, that a summary of the salient points will not be amiss here, because I believe that our observations provide a satisfactory explanation of several problems raised by Professor Sharp. They are also, I hope, of general interest.

In estimating vitamin C chemically in milk by the method of Birch, Harris and Ray,[3] I[4] observed very marked fluctuations in the concentration of that vitamin from day to day. The possible causes of this phenomenon were investigated by Mattick and myself,[5] who ultimately found that milk which originally gave a positive vitamin C titration failed to reduce the indophenol reagent after a short exposure to light in

[1] From the Department of Anatomy, Yale University School of Medicine. Aided by grants from the International Cancer Research Foundation and the Anna Fuller Fund. Acknowledgment is made to the Fluid Research Fund of Yale University.

[2] "Endocrinology" (in press).

[1] C. W. Stiles, *U. S. Hyg. Lab. Bull.*, 40: 1–18, 1908.

[2] J. T. Moore, *Amer. Jour. Trop. Diseases*, 2: 518–525, 1915.

[3] E. C. Faust, "Human Helminthology," 1929.

[4] H. C. Li, *Amer. Jour. Hyg.*, 10 (3): 527–550, 1929.

[5] J. F. Mueller, *Jour. Parasit.*, 21 (2): 114–121, 1935 and 22 (5): 471–478, 1936.

[1] SCIENCE, 84: 461, 1936.

[2] By S. K. Kon and M. B. Watson.

[3] *Biochem. Jour.*, 27: 59, 1933.

[4] S. K. Kon, *Nature*, 132: 64, 1933.

[5] *Nature*, 132: 446, 1933.

glass bottles. Some time later Booth and Kon[6] showed that the power to reduce the reagent could be restored to an extent varying with the length of exposure to light by treating the milk with hydrogen sulfide. The further detailed study by Kon and Watson yielded the following information:

Under the action of light the ascorbic acid of milk undergoes reversible oxidation, most probably to dehydroascorbic acid. Visible light of short wave-length (blue and violet) is mainly responsible for the reaction. Ultra-violet light is also probably active, but yellow and red are almost without effect. The action of light does not take place in the absence of oxygen, and the reversible oxidation follows the laws of a unimolecular reaction. The reversibly oxidized product is biologically active. The product suffers further decomposition spontaneously, without the agency of light, giving a substance which fails to decolorize the indophenol reagent even after treatment with H_2S and is devoid of biological activity. This reaction does not run to completion. Synthetic ascorbic acid added to milk behaves, under the action of light, in the same way as the ascorbic acid originally present.

Pasteurization by the holder method destroys the reversibly oxidized, but does not affect the reduced, form of ascorbic acid in milk. Milk, as secreted by the normal cow, contains only reduced ascorbic acid. The amount of destruction of vitamin C caused by pasteurization in the absence of catalytic metals (copper) depends on the previous exposure of the milk to light.

S. K. KON

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FISH IN THE LATAH FORMATION OF IDAHO

THE purpose of this notice is to bring to the attention of vertebrate paleontologists the existence of fish skeletons in the Latah formation.

In May, 1936, Dr. R. L. Lupher conducted a field trip along the Clearwater River for his class in historical geology. The writer was very pleased to accompany the class as a guest. One of the stops was at a road cut, on the north bank of the river, eleven and one half miles east of Lewiston, Idaho, in T. 36 N., R. 4 W., Boise Meridian. This seems to be the collecting locality called Station 4 by Kirkham and Johnson,[1] who found at least twelve species of plants, which were later described by Berry.[2] Here the Latah beds strike N. 85° W. and dip 20° W. They are composed of yellow and porcelaneous white shale with an eight-inch bed of gray volcanic ash passing through the center of the outcrop.

Fragmentary remains of fish were found by several members of the party. Messrs. J. Bone, A. O. Huhn, M. Morsing and J. Storall uncovered three complete skeletons, which they kindly presented to the writer. Since the first discovery the writer has visited the outcrop twice and both times has found fish remains. The skeletons are from four to six inches long and have been determined temporarily as belonging to the genus *Leuciscus*. Accurate determinations, as yet, have not been made. One slab, measuring ten inches by fourteen inches, has yet to be uncovered.

Dr. F. B. Laney[3] has found bone fragments, and Berry[2] has noted occasional scales, spines and bones in the Latah formation; but, so far as the writer is able to ascertain, this is the first discovery of complete and articulated fish skeletons. Although these skeletons are from only one locality in Idaho, the writer is confident, because of the fine grain of the clay-shale and the excellent preservation of plant remains, that more diligent collecting will uncover many such skeletons in the Latah formation of both Idaho and Washington.

VERNON E. SCHEID

UNIVERSITY OF IDAHO

THE PROTECTION OF PLANTS

RECENT experience[1] shows that the effect of poison-sprayers (arsenic, copper, lead, etc.) is found to extend much beyond its immediate objective, namely, the protection of crops against parasitic attacks.

Apart from its inability to discriminate between friend and foe, this treatment represents in its cumulative poisoning action upon the soil a grave danger to future plant life both by (a) its inhibition of growth and (b) the introduction of toxic constituents into plant metabolism. A greater stress upon the augmentation of the plant's natural means of protection, such as sanitation, nutrition and stock selection, might perhaps lessen the recourse to these artificial protective means.

Now from the work of Greenbank[2] on the inhibition of rancidity in fats and oils (with a possible extension to cereals) by maleic acid, and that of Copisarow[3] on (a) the bactericidal and fungicidal properties of maleic acid, (b) the close chemical and physiological resemblance, if not identity, of maleic acid with the natural

[6] *Nature*, 134: 536, 1934.

[1] V. R. D. Kirkham and M. M. Johnson, *Jour. Geology*, 37: 483–504, 1929.

[2] E. W. Berry, *U. S. Geol. Survey Prof. Paper 185*, pp. 97–125, pls. 19–24, 1934.

[3] Oral communication.

[1] Report of the American Society of Plant Physiologists, Western Section, SCIENCE, 84: 171, 174, 1936.

[2] Greenbank, U. S. Pat., 1898, 363, Feb. 21, 1933; SCIENCE, 77: *Suppl.*, page 6, February 24, 1933.

[3] Copisarow, *Jour. Pom. Hort. Sci.*, 14: 9, 1936.

inhibitor—"blastokolin"—present in fruit and vegetables[4] and (c) the probable transition of this inhibitor into the natural accelerator (ethylene), a transformation marking the ripening stage in fruit development and expressed chemically by the degradation of maleic acid to ethylene and carbon dioxide—it appears that the substitution of the poison-sprayers by the natural inhibitor may constitute a practical means of assisting the plant's self-protection. As in the case of stored fruit and vegetables spraying with a solution or emulsion of maleic acid in ethereal oil, paraffin, solvent naphtha or some other suitable medium may perhaps be found effective for such plant treatment.

The application of maleic acid may extend not only to bacteria and fungi, but also to insects in the early stages of their metamorphosis. Again the presence of the inhibitor in seeds and its ready diffusion in an aqueous medium[4] suggests the possibility of treating the seeds with maleic acid as an anti-virus measure. It is perceivable that the preferential cultivation of barbless, husk-free, thin-skin, etc., varieties eliminates the hardier types in our crops, as the accelerated elution of the free, or hydrolysis of the combined inhibitor (as in the case of vitamin C[5]) exert a disturbing influence both on the enzymic equilibrium and general metabolism and increases the susceptibility to parasitic attacks.

The controlled use of maleic acid would obviate any appreciable interference with the normal course of metabolism or any ill effect on food values.

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SCIENTIFIC BOOKS

RATIONAL FUNCTIONS

Interpolation and Approximation by Rational Functions in the Complex Domain. By J. L. WALSH. American Mathematical Society Colloquium Publications, Volume XX, 1935.

IN the field of approximation by rational functions in the complex domain the author of this monograph has been among the most active and successful investigators during more than the last half-score of years. His contributions have been widely read, and his authority in the subject is generally recognized. It would be surprising under these circumstances were his book to be found anything but a valuable and significant addition to the mathematical literature. There is no cause for such surprise. Professor Walsh has written here a clear, careful, thorough and scholarly account which will not fail to receive general commendation. The book is a worthy addition to the important series of Colloquium Publications of the American Mathematical Society.

The subjects of interpolation and approximation, if their many aspects and ramifications are included, are too vast by far to admit of detailed treatment in any single volume. The present monograph confines itself, therefore, specifically to sequences of polynomials or general rational functions which are determined in one of the following two ways; *i.e.*, by the fact that they coincide with (interpolate) a given function upon an assigned set of points or by the fact that they lie closest to (approximate) the given function in a certain specific sense. The considerations are made entirely in the complex domain, the given function being usually assumed to be analytic. Topics pertaining immediately to the real variable are given no place here. It will be clear from this that the author has restricted his book to those aspects of the subject which have been centers of his own research. This, of course, is entirely in the tradition of this series of publications.

Of the field considered the book gives a thorough and comprehensive treatment, generally with an ample degree of detail. Many results of the author's which are included here have not heretofore been published. The material, as one would expect, is technical to a high degree and requires, therefore, to be read closely and with care. There is much of it. However, its organization, which could have been no simple problem, has been effectively and skilfully carried out. The work is well documented—the bibliography including some 150 titles.

In point of style and arrangement there is much similarity with that of the author's recent essay, "Approximation by Polynomials in the Complex Domain," Memorial des Sciences Mathematiques, Paris, 1935, wherever that essay and the present monograph deal with the same material. The monograph, however, in distinction from the essay, is a systematic exposition, not an outline, and among other things deals with general rational functions as well as with polynomials.

In brief summary the contents of the twelve chapters of the book may be described somewhat as follows: In the early chapters general function theoretic considerations and the basic theorems on approximation are set forth, and are followed by discussions and theorems on series of interpolating polynomials—Jacobi series—

[4] Kockemann, *Ber. Deut. Bot. Ges.*, 52: 523, 1934; Shuck, SCIENCE, 81: 236, 1935.

[5] Levy, *Nature*, 138: 933, 1936.

lemniscate curves—conformal mapping—the convergence, overconvergence and maximal convergence of sequences of polynomials. There follow in the next chapters discussions of polynomials of approximation best in the sense of Tchebycheff, or in the sense that they minimize suitable integrals—of orthogonal polynomials and their theory—of polynomials of interpolation in uniformly distributed points—and some comparative study of the properties of interpolation and of approximation. The later chapters, finally, deal with formulas for rational functions of interpolation and sequences of such functions—the principle of duality—approximation by means of rational functions—auxiliary conditions—and the existence and uniqueness of rational functions of best approximation.

It was the author's expressed purpose to write a book which would serve both the novice in the subject and the specialist. The beginner, who would necessarily have familiarity with the general theory of functions of a complex variable, will find the book a very readable one which greatly facilitates an introduction to the subject. The specialist will find the book indispensable. Both will thank Professor Walsh for his work.

RUDOLPH E. LANGER

REPORT OF THE ASSOCIATION OF GEODESY

Travaux de l'Association de Géodésie de l'Union Géodésique et Géophysique Internationale, Tome 12, publié par le Secrétaire, Georges Perrier. Rapports généraux établis à l'occasion de la Cinquième Assemblée Générale, Lisbonne, 14–25 Septembre, 1933. vi + 552 pp., 4to. 180 francs. Paris, au Secrétariat de l'Association, 1935.

THIS volume comprises eight different reports, each with its own independent paging, on various aspects of geodesy and in five different languages. It would be impossible to summarize its contents or to comment on them with any profit to the reader, so it seems best to take the space ordinarily occupied by detailed summaries and comments for some explanations about the history of the organization issuing this volume.

Before the world war there was an International Association of Geodesy, devoted to geodesy alone. When it was founded in 1862 by General Baeyer, it included only some of the German states and neighboring countries of Europe, but it soon became international in scope. Its triennial conferences were held at various places in Europe. The last of these was at Hamburg in 1912. The world war broke up this international scientific organization, as it broke up others, although a "Reduced Geodetic Association of Neutral Nations" survived the world war and maintained one of the principal cooperative international enterprises of the old association, the International Latitude Service, established in 1899 to study the variation of latitude.

After the war, however, this reduced association did not expand to the original dimensions of the old association but, after some hesitation, merged its activities with those of a new organization that tried to put in practice the idea that geodesy is but one branch of earth-science and has therefore close relations with other branches of earth-science, all of which are included in the general term "geophysics." The word "geophysics" has also acquired the special meaning of the use of physical methods to determine subsurface structure for strictly commercial purposes; this special meaning does not concern us here.

In 1919 there was organized at Brussels an International Union of Geodesy and Geophysics with several divisions, first termed sections and later associations, of which the Association of Geodesy, which issues this volume, was one. The other associations deal with seismology, physical oceanography, terrestrial magnetism, meteorology, hydrology and volcanology. One purpose of the Union was to emphasize the points of contact between these different branches of earth-science and to facilitate the intercourse among workers in them. Like most other purposes, however, it has been realized only imperfectly.

Another less laudable purpose seemed to be to keep the Germans and their allies in the war out of the organization. The wording of the statutes was such as to discourage their admission. This wording was changed, however, in 1926 with the effect of bringing some of Germany's allies into the Union, but at this writing and as far as the reviewer knows, neither Germany itself nor Austria.

Since its organization the Union and its associations have held general assemblies at Rome (1922), Madrid (1924), Prague (1927), Stockholm (1930), Lisbon (1933) and Edinburgh (1936). The next meeting is scheduled for Washington in 1939.

The Association of Geodesy issues three regular series of publications, the *Bulletin Géodésique* (quarterly), the national reports presented to various general assemblies and special reports on various subjects. The *Bulletin Géodésique* is a journal containing articles of scientific interest, news notes, official announcements, etc. The national reports presented to each assembly cover the activities of the various member nations since the preceding assembly. Each nation speaks for itself and prints its own report in its own way but on pages of uniform size. These separate reports, bound together and supplied with a cover, constitute the volume of national reports. The special reports, of which the volume under review is one, are

prepared by specially designated reporters for various subjects. These reports try (*try* is the proper word, as the reviewer knows and as may be read in so many words or between the lines in the reports themselves) to cover the progress in the designated subject for the three years preceding. The present volume contains the following reports intended for the Lisbon meeting and covers the calendar years 1931–1933, inclusive:

"Precise Leveling," J. Vignal and R. Taton (France). 155 pages.
"Latitude, Longitude and Azimuth and Geodetic Applications of Wireless Telegraphy," H. L. P. Jolly (Great Britain). 144 pages.
"Deflections of the Vertical," K. Wold (Norway). 27 pages.
"Gravity on Land," E. Soler (Italy). 107 pages.
"Gravity at Sea," F. A. Vening Meinesz (Netherlands). 11 pages.
"Isostasy," W. Heiskanen (Finland). 51 pages.
"Projections," H. Roussilhe (France). 38 pages.
"Earth Tides," W. D. Lambert (U. S. A.). 19 pages.

Triangulation and base measurement seem obvious omissions, for they are the backbone of geodesy, but there were difficulties in completing reports on these subjects and a full report is promised for a later date, to include the data submitted for the General Assembly at Edinburgh in 1936. The report by Kimura on the variation of latitude is included in the national report of Japan.

There is much of interest and value in these reports, but detailed comment would take much space and would require the concentration of an unusual amount of specialized knowledge in one reviewer. The manner of treatment is as varied as the subjects and the nationality of the reporters. Two general comments suggest themselves:

(1) One purpose of the Association is to attain some degree of uniformity in notation, nomenclature and methods of procedure. It might be feared that this desired uniformity would in time be overdone, but these reports afford no indication that this fear is justified.

(2) Geodesy is an old science, dating, let us say, from the time of Eratosthenes (200 B.C.), but it is far from being a finished body of doctrine. There are plenty of problems still awaiting solution.

WALTER D. LAMBERT

SPECIAL ARTICLES

STIMULATED ACTIVITY OF NATURAL ENEMIES OF NEMATODES[1]

SOROKIN,[2] Zopf[3] and others long ago recorded the destruction of nematodes by fungal parasites or by fungi which trap nematodes with specialized organs of capture, then penetrate and consume them. Recently, Drechsler[4,5,6] has added greatly to the list of nema-capturing fungi and to an understanding of their means of capture.

Many of the nema-capturing fungi grow freely as saprophytes, most of them produce aerial conidia, and several are also disseminated by the movement of nematodes carrying detached fragments of fungus. Most of them appear relatively non-specific, capturing nematodes of several genera apparently with equal ease. Likewise, at least some of the non-trapping parasites are non-specific, but others may attack only certain genera or related genera of nematodes.

Most of the fungi reported by Drechsler have thus far been reported only from the vicinity of Washington, D. C. *Arthrobotrys oligospora* Fresenius and several parasites, however, have been recorded from various parts of Europe. The lack of more numerous reports probably results from lack of adequate search with appropriate techniques.

Since October, 1935, the writer and associates have recognized over 20 nema-destroying fungi, including simple parasites and trappers in Hawaiian field, garden and forest soils. Many of them destroy larvae of *Heterodera marioni* (Cornu) Goodey as readily as they do nematodes formerly reported to be attacked. A very superficial survey has shown certain of them to be wide-spread in the Hawaiian Islands. One or more has been found in every old pineapple field thus far sampled adequately, while a plot of approximately two acres which has been sampled more intensively has yielded 15 distinct forms. Several of these fungi appear identical with forms described elsewhere, including *Arthrobotrys oligospora* Fresenius, *Catenaria anguillulae* Sorokin, *Harposporium anguillulae* Lohde, *Stylopage hadra* Drechsler and forms similar to or identical with Drechsler's[7] numbers, 4, 5, 7, 12, 13 and 15. Several others appear to be undescribed.

Even in the plot in which 15 such fungi have been

[1] Published with the approval of the director as Technical Paper No. 94 of the Pineapple Experiment Station, University of Hawaii.
[2] N. Sorokin, *Ann. d. Sci. Nat. Bot.*, Ser. 6, 4; 62–71, 1876.
[3] W. Zopf, *Nova Acta Ksl. Leop.-Carol. Deutschen Akad. Naturforscher*, 47 (4): 167–168, 1884; 52 (7): 314–341, 1888.
[4] C. Drechsler, *Jour. Washington Acad. Sci.*, 23: 138–141, 267–270, 355–357, 1933.
[5] C. Drechsler, *Mycologia*, 26 (2): 135–144, 1934.
[6] C. Drechsler, *Mycologia*, 27 (2): 206–215, 1935.
[7] See footnote 4.

found, the root knot nematode, *Heterodera marioni*, is still securely established, although less abundant than in some other pineapple fields. Apparently, extermination of plant parasitic nematodes by such fungi is not to be expected. Laboratory and glasshouse experiments have, however, demonstrated the possibility of so increasing the activity of these fungi that they assume some practical significance in control of *H. marioni*.

Incorporation of fresh plant material into soil is followed by a rapid rise in the total population of free-living nematodes. A 65-fold increase was recorded after 14 days in one experiment, with *Aphelenchus avenae* Bastian, *Aphelenchoides parietinus* Bastian, *Cephalobus* spp., and *Rhabditis* spp. all abundant. Parasites and trappers were conspicuous in association with these nematodes when washed from the soil for counting. Within 21 days the nematode population was greatly reduced and nema-destroying fungi were still more conspicuous. Such fungi included at least 3 trappers and 2 non-trapping parasites. Ample confirming evidence establishes the fact that as the total nematode population increases, the natural enemies of nematodes so increase their activity that the multiplication of nematodes, favored by an abundant food supply, is overbalanced.

During a period of such increased activity of nema-destroying fungi, one might expect the larvae of obligate plant-parasitic nematodes, unable to reproduce under these conditions, to be reduced in numbers. Experiments have demonstrated this to be the case with *H. marioni*.

In a series of laboratory and glasshouse tests, chopped pineapple plant material has been mixed with naturally infested field soil and allowed to decompose under favorable conditions of temperature and moisture during various periods of time prior to the measurement of surviving populations of infective larvae by the indicator plant method. The soils thus far used are from pineapple fields in two localities on the island of Oahu. Summarized results are presented in Table I.

TABLE I

REDUCTION OF POPULATIONS OF INFECTIVE LARVAE OF *Heterodera marioni* IN NATURALLY INFESTED SOIL DURING DECOMPOSITION OF CHOPPED PINEAPPLE PLANT MATERIAL, MEASURED BY GALL COUNTS ON WHIPPOORWILL COWPEA INDICATOR PLANTS

Experiment No.	Rate* of application	Duration of decomposition (weeks)	Frequency of mixing† (weeks)	Galls per 2400 g. soil: Check	Galls per 2400 g. soil: Decomposition
1	200	12	1	611 ± 46.5	2.0 ± 0.8
5	200	12	1	190 ± 14.0	27.0 ± 5.3
	150	12	1	"	21.0 ± 3.0
	100	12	1	"	31.0 ± 5.0
	50	12	1	"	66.0 ± 15.3
6	150	12	3	1415 ± 153.5	98.0 ± 13.2
	150	12	1	1036 ± 93.5	90.0 ± 11.5
9	150	4	2	7314 ± 525.3	425.0 ± 62.0
		8	2	2229 ± 237.6	609.0 ± 63.4
		12	2	5297 ± 431.8	982.0 ± 173.8

* Tons per acre foot equivalent of the amounts actually added to 2400 g. quantities of soil.
† Mixing consisted of a mild shaking of the soil jars.

In each instance the check soil was held under laboratory conditions during the period allowed for decomposition in the treated soils, with no host plants present. Striking reductions in populations of infective larvae have been observed in every experiment. Statistical treatment, following Miles,[8] based on standard error of difference, shows odds greater than 1999:1 for every comparison of decompositon and check in Table I. No less significant results have yet been obtained.

Pineapple plant material was used in these experiments, since in Hawaiian pineapple fields at the end of three to four years' growth, the amount of plant material to be disposed of prior to replanting frequently exceeds 100 tons and sometimes 150 tons per acre. Current practices involve decomposition of this material in place, chiefly on the soil surface, with gradual incorporation into the soil. The effects of this field handling and of more prompt plowing under upon nematodes are still undetermined.

Corresponding results follow decomposition of other plant materials. For example, data not included in Table I were obtained in Experiment 1 following the application of grass (*Panicum barbinode*) at a rate equivalent to 165 tons per acre-foot. This excessive application was for comparison with approximately equal dry matter in 200 tons pineapple per acre. The check was the same as shown in Table I, Experiment 1, with 611 ± 46.5 *H. marioni* galls per jar of soil. After decomposition of grass, the gall count was 16.5 ± 2.9. This reduction, though not quite equal to that obtained with pineapple in this experiment, still has enormous statistical significance.

The mechanism of stimulated activity of natural enemies of nematodes reported here may have been a factor in the beneficial results attributed by various investigators to green manures on Heterodera-infested soils, for this mechanism may be expected to reduce soil populations of obligate plant-parasitic nematode larvae generally where effective nema-destroying fungi occur and where sufficient organic matter is incorporated into the soil to build up a heavy population of free-living nematodes.

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PINEAPPLE EXPERIMENT STATION
HONOLULU, T. H.

[8] S. R. Miles, *Jour. Amer. Soc. Agron.*, 26: 341-346, 1934.

SEX VARIATIONS IN THE UTILIZATION OF IRON BY ANEMIC RATS

THE finding that all compounds of iron are not equally effective in the remission or prevention of nutritional anemia even in the presence of ample copper has led to an increased interest in the determination of iron availability.[1,2] The accepted method for measuring the amount of iron in a foodstuff which is utilizable for hemoglobin formation consists, briefly, of feeding the food of analyzed iron content, with copper, to anemic rats upon a whole milk diet and comparing the hemoglobin response with that obtained from anemic rats given the same amount of iron as ferric chloride.

In the course of investigation in this laboratory of the hematopoietic value of foodstuffs by this method, a marked difference in response between male and female rats has been consistently noted. As it has been customary to use males and females interchangeably in other laboratories, the effect of a sex difference upon the accuracy of the results obtained seemed worthy of investigation.

EXPERIMENTAL PROCEDURE

The technique used for the preparation of the anemic rats used in the test was essentially that of Elvehjem and Kemmerer.[3] When young rats were two weeks of age the stock colony ration provided for the mothers was replaced by whole-milk powder (Klim). During the third week of age, therefore, the young had access to milk only. The mothers were separated from their young for several hours each morning and allowed to eat as much of the stock colony whole wheat and milk ration as they desired. They were then carefully brushed and returned to their young. When three weeks of age the young were weaned and continued on whole-milk powder as sole food.

Blood samples were taken from the tail at weekly intervals, and the hemoglobin content was determined by comparison with a standard Newcomber plate in a Duboscq colorimeter. By the fourth or fifth week the hemoglobin level of rats in this laboratory prepared in the fashion described above fell to an average of 3.9 (range 2.9 to 4.5) grams per 100 cc of blood. At this time the animals were placed in individual galvanized iron cages with raised screen bottoms. The whole-milk powder which served as the basal diet and distilled water were provided *ad libitum* in glass containers.

The iron supplements or foods under test were fed separately for a subsequent test period of six weeks duration. Throughout the test period, .05 mg Cu as $CuSO_4$ and .04 mg Mn as $MnCl_2$ were given daily. The course of hemoglobin regeneration was followed by hemoglobin measurements made at two-week intervals. The comparative hemoglobin responses of males and females to iron supplements of the same magnitude, given as $FeCl_3$ or a food, appear in Table I,

COMPARATIVE HEMOGLOBIN REGENERATION IN MALE AND FEMALE RATS

Supplement fed daily	6 weeks gain in Hb (gms per 100 cc)	
	Males	Females
.014 mg Fe as $FeCl_3$	1.0	2.3
.050 " " " "	2.9	4.2
.1 " " " "	5.5	6.5
.2 " " " "	9.1	10.9
.25 " " " "	10.4	10.7
.3 " " " "	10.1	10.2
3 gms whole wheat	7.7	9.1
3 " rolled oats	5.7	7.0
1.5 gms dried lima beans	4.8	6.1

which records the gains in hemoglobin concentration during the six weeks test period. At least 10 males and 10 females were used on each level of iron.

It may be seen that hemoglobin regeneration was greater in the females than in the males fed the same amount of iron or given the same amount of an iron-bearing food. This difference between the sexes was consistently noted among litter mate rats except at levels of iron feeding greater than .2 mg daily. At daily iron levels of .25 mg and above, the iron intake was sufficiently high to promote maximum hemoglobin development in all the rats of this age so that a difference between the sexes in the rate of gain of hemoglobin could not be expected. That the observed differences are significant is indicated by the fact that the experimentally obtained differences are from three to six times greater than the probable errors of these differences.

The explanation of this difference in response may lie in the greater store of iron in the female[4] which becomes available for hemoglobin formation upon the giving of copper. This view is substantiated by the finding that the difference between male and female response was not observed after two weeks of the supplemental feeding and also by the fact that the difference is approximately the same at all levels of iron supplementation. The original hemoglobin level of all the males discussed in this paper was 3.8 gms per 100 cc of blood as compared with a level of 3.9 gms in the females at the beginning of the test period. Thus a difference in reserve supply of iron in the males and

[1] C. E. Elvehjem, E. B. Hart and W. C. Sherman, *Jour. Biol. Chem.*, 103: 61–70, 1933.

[2] W. C. Sherman, C. A. Elvehjem and E. B. Hart, *Jour. Biol. Chem.*, 107: 383–394, 1934.

[3] C. A. Elvehjem and A. R. Kemmerer, *Jour. Biol. Chem.*, 93: 189–195, 1931.

[4] Mary Swartz Rose and Lan-Chen Kung, *Jour. Biol. Chem.*, 98: 417–437, 1932.

females was not indicated by a significant difference in hemoglobin concentration of the blood at the beginning of the test period. Elvehjem[3] has stressed the necessity of exhaustion of body iron stores in preparation of test animals, and the question arises as to what evidence of exhaustion can be accepted. Allowing the hemoglobin level to fall too low results in animals which are sickly and not capable of a normal response to the iron supplement given subsequently.

Whatever is the explanation of this greater hemoglobin regeneration in anemic female rats as compared with males, it is the authors' belief that ignorance of this fact may explain some of the discrepancies of the same magnitude in the findings in various laboratories relative to the availability of iron in foodstuffs.

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A CATALYTIC METHOD FOR THE PREPARATION OF α-PYROABIETIC ACID

THE preparation of the so-called pyroabietic acids by the usual prolonged high temperature treatment of rosin[1, 2] entails very considerable pyrolytic decomposition, with consequent contamination of the resulting product. In connection with recent experiments on dehydrogenation of rosin products (rich in pimaric acids), by way of palladium charcoal,[3] it was noted that an appreciable proportion of a positive rotating acid survived the high temperature (300–325° C.), a region normally well above that at which decarboxylation of rosin acids takes place. The isolated acid did not give a crystalline sodium salt characteristic of α-pimaric acid, nor did it have its optical properties.[4] Its melting point (171–172° C.), rotation ($[\alpha]_d^{20} + 54°$; $[\alpha]_j^{20} + 58°$) and other properties agree well with those of α-pyroabietic acid described by Dupont-Dubourg, Fanica and others. Subsequent experiments with the palladium charcoal catalyst showed that the isomerization can be carried out at much lower temperatures (250° C.) and completed in about two or three hours. The yield at the lower temperature is excellent, the product quite uniform and apparently unaccompanied by the usual intermediate isomers. Acids with the same properties were obtained with this catalytic procedure from α-pimaric acid, l-abietic acid (Schulz), mixed rosin acids and rosins from longleaf and slash pines (*Pinus palustris* and *Pinus caribaea*) and French gum (*Pinus pinaster*). This finding, which would indicate highly selective isomerizing action for the catalyst, is in marked contrast with results obtained by the usual 100-hour heating without a catalyst when applied to rosin acids and rosins from different sources.[2]

Preliminary experiments showed that palladium charcoal catalyzes the isomerization even at 200° C., but not as effectively as at higher temperatures. Platinum charcoal, nickel charcoal and, to a lesser extent, activated charcoal itself also catalyzed the formation of pyroabietic acid.

This laboratory is at present engaged in a systematic study of the application of various catalysts and different types of carriers to the primary rosin acids, as well as the rosin acids or partially isomerized acids. Publication of more comprehensive data is contemplated in the near future.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

PRESERVING THE NATURAL COLOR OF GREEN PLANTS[1]

IMPROVED teaching methods of botanical subjects demand better demonstration materials. Living specimens should be preferred to non-living ones. However, increased difficulties in obtaining living specimens forces the use of more preserved forms. Better methods of preservation are needed to increase attractiveness of dead specimens. Several methods have been published which are more or less useful. Keefe's[2] method is outstanding among these. The writer has experimented with older formulae as well as new combinations for a period of about three years. Out of this work success with one new, general method seems to justify publication.

Formalin-acetic acid-alcohol solutions (5 cc of commercial formalin, 5 cc of glacial acetic acid and 90 cc of 50 per cent. ethyl alcohol; or 10 cc of commercial formalin, 5 cc of glacial acetic acid and 85 cc of 70 per cent. ethyl alcohol) are in general excellent preservatives. They are being used extensively for museum and histological materials. By adding 0.2 gram of copper sulfate to 100 cc of either of these F.A.A. formulae, a preservative results which will bring about an almost normal green color in nearly all

[1] Dupont and Dubourg, *Bull. Inst. Pin.*, 51: 181, 1928.
[2] Fanica, *Bull. Inst. Pin.*, 44: 155, 1933.
[3] Method of Ruzicka and Waldman, *Helv. Chim. Act.*, 16: 842, 1933.
[4] S. Palkin and T. H. Harris, *Jour. Am. Chem. Soc.*, 55: 3683, 1933.

[1] Papers from the Department of Botany, the Ohio State University, No. 383.

[2] Keefe, Anselm Maynard. SCIENCE, 64: 331–332, 1926.

chlorophyll-bearing plant organs. It is not necessary to weigh the copper. A stock of the preservative may be saturated by adding an excess, and the remaining undissolved copper removed, or a lump may be dropped in the preservative along with the specimens and left until proper color fixation occurs. When the latter method is employed the specimens should be shaken after standing a few hours to insure complete distribution of the copper. Successful results also may be obtained even if the copper is not added for six to eight hours after the specimens enter the solution. Some difficulty may be experienced, especially with certain algal cultures in which excess carbonates are present. A bluish-white precipitate (probably copper carbonate) may accumulate if excess copper is added and allowed to remain. Removal of the extra copper after saturation prevents much of this. Ordinarily the usual discoloration occurs soon after specimens enter the preservative, but after three to four days in the F.A.A.-copper sulfate solution usually a green color appears. By watching development of its intensity and removing specimens when the proper color is obtained, excellent specimens may be secured. They are transferred then to a copper-free F.A.A. solution, 70 per cent. alcohol or other preservatives for permanent storage. In a few plants, such as *Berberis* and *Ophioglossum*, some difficulty may be experienced in obtaining sufficient penetration for rapid development of the proper green color. However, if such specimens are boiled in the preservative for fifteen to twenty minutes good results follow. Care must be taken to stop the heating when coloration has developed to the proper point, and to transfer specimens to a copper-free solution. This quick method may be employed wherever heating is not injurious to the plants.

The color reaction may also be hastened by exhausting air from tissues immediately after specimens enter the preservative. This can be done easily by means of the common vacuum pump which is run by water-supply pressure. This is especially usable for fern gametophytes and young sporophytes. In these two cases permanent coloration can be obtained within fifteen to thirty minutes. Thicker tissues should be allowed to stand in the copper solution for a day or so after air exhaustion.

The addition of copper sulfate to Transeau's Algal Preservative also gave similar results as for the above. Dr. E. N. Transeau developed this preservative over twenty years ago. It is an excellent preservative for algae as well as for general preservation. The formula calls for 6 parts water, 3 parts 95 per cent. ethyl alcohol and 1 part commercial formalin. If marine algae are to be preserved sea water is used in making up the solution. After fixation has occurred, 5 to 10 per cent. glycerine may be added to prevent destruction of algal specimens in case of loss of preservative by evaporation.

Several tissues preserved in F.A.A.-copper sulfate solution have been sectioned and stained. Cellular structure is preserved the same as for straight F.A.A., and no apparent difficulty in staining has been encountered. The copper sulfate even enhances differentiation in some cases. This may be due to the copper salt rendering the tissues more acid. The green color can not be held with sufficient intensity to permit use in the Venetian Turpentine Method without further staining. Efforts in this direction have been made, using fern gametophytes and moss protonemata.

The chief advantages of this method and its modifications are: (1) a green color closely approximating that of ordinary chlorophyll is obtained; (2) preservative ingredients are easily secured and inexpensive; (3) the method is rapid; (4) fixation is sufficiently good for many histological problems; (5) color fixation does not interfere with staining; (6) and the preservative gives successful results with numerous representatives of Algae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.

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A MODIFIED QUINHYDRONE ELECTRODE FOR TISSUES[1]

THE quinhydrone electrode has enjoyed extensive use in the determination of the pH of physiological systems. Its reliability in solutions containing proteins was investigated extensively by Shau-Kuang Liu[2] in 1927. Recently, Pierce[3] and Pierce and Montgomery[4] developed a micro-modification of the Cullen[5] electrode and used it successfully to determine the pH of the glomerular urine of Necturus and the aqueous humor of rachitic rats. With this type quinhydrone electrode the broken skin of the animal in contact with the saturated potassium chloride solution completes the junction of the two half cells. To avoid this, which gives rise to erratic potentials with the intact skin and practical difficulties with the broken skin, the following modification of the quinhydrone electrode was designed and found serviceable in tumor tissues where sufficient fluid was present to fill the capillary.

With this quinhydrone electrode a series of Hastings[6] and Sendroy's phosphate buffer mixtures was measured at 20° C.

[1] The expense of this work was defrayed in part by a grant from the International Cancer Research Foundation.

[2] Shau-Kuang Liu, *Biochem. Z.*, 185: 243, 1927.

[3] J. A. Pierce, *Jour. Biol. Chem.*, 111: 501, 1935.

[4] J. A. Pierce and H. Montgomery, *Jour. Biol. Chem.*, 110: 763, 1935.

[5] G. E. Cullen, *Jour. Biol. Chem.*, 83: 535, 1928.

[6] A. B. Hastings and J. Sendroy, *Jour. Biol. Chem.*, 61: 695, 1924.

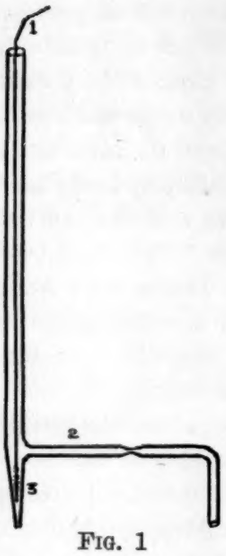

FIG. 1

"1" is a platinum wire 29 gauge, connected with the potentiometer system and extending down through the electrode vessel into the capillary "3." At the lower end it is coated with quinhydrone according to the Pierce technique. "2" is a side arm containing a firm saturated KCl agar bridge, extending into saturated KCl and through this connected with the saturated calomel electrode. The constriction lends immovability to the gel. "3" is a capillary 12 mm long, 0.25 mm at the lower end and increasing to 2 mm at the upper end where it joins with "2." Generally the capillarity of "3" is sufficient to bring the liquid in contact with the bridge in "2," if not, gentle suction may be applied at the top of the electrode vessel by means of a syringe prior to the insertion of the platinum wire.

	Calculated pH	Determined pH
	7.01	6.93
	6.81	6.79
	6.91	6.89
	7.36	7.42
M/20 potassium biphthalate, 25° C.	3.97	3.98

The tumor fluid of Walker rat sarcoma No. 319[7] showed a pH lying between 7.50 and 7.70.

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A SIMPLE CARBORUNDUM PENCIL

ONE of the problems which so frequently confronts the microtechnician, be he botanist, zoologist or bacteriologist, when staining, is to determine on which side of the slide the sections (or bacteria) are. In attempting to insure getting the correct answer to his question he may use a glass or pottery pencil, he may make a scratch on the slide with a small piece of carborundum, he may use the more expensive slides with one end "frosted" or he may merely trust to luck. However, none of these methods is entirely satisfactory when it is necessary to put considerable data upon the slide, such as the cytologist or cyto-geneticist finds necessary in his work.

For myself, I have, while being concerned with a cyto-genetical study, solved this problem of keeping the sections properly orientated by means of a very simple, but practical, tool which was easily constructed.

A small, all-wood penholder was used and the inside of the pen-end was scooped out to a depth of 2-2.5 cm. This cavity was filled with a thick paste of plaster of Paris and a piece of carborundum 15×3 mm imbedded in the paste so as to leave about 5 mm protruding beyond the end of the penholder. After the plaster of Paris has formed a rigid matrix one is able to make fine lines, small numbers or letters on his slides.

This device has proven far more satisfactory than any of those methods previously used. Likewise, such a tool is certainly good insurance against loss of valuable sections and data.

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[7] W. Schopper, *Arch. f. exper. Zellforsch.*, 14: 14, 1933.

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